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ABSTRACT

The thesis of this paper is that vocational education and the persons it espouses to serve deserve the potential benefits of research and development which are not being maximized at the present time. Following a brief summary of vocational education legislation, the general efficiency and ability of the research and development program is critically reviewed in terms of policies, personnel, and coordination. Factors that inhibit optimum research and development are: (1) Lack of adequate numbers of trained vocational education researchers, (2) lack of confidence in vocational educators by the U. S. Commissioner of Education, (3) problems in developing an organization structure for research, (4) lack of long-range priorities and planning mechanisms, (5) continuous reorganization within the Department of Health, Education, and Welfare, (6) magnitude and continuity of funding, (7) lack of "hard money" research positions, (8) expectations of research, and (9) money siphoned off to support other activities. Five conditions are described which, if met, would contribute substantially to a more effective research and development program. (Author/RG)

THE STATUS OF RESEARCH CAPABILITY IN VOCATIONAL EDUCATION RESEARCH AND DEVELOPMENT*

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The general topic of this paper, "status of the capability", implies two concepts, namely, general efficiency and ability and a legal right to perform. Vocational education R+D's "legal right to perform" is well founded in the Vocational Education Act of 1963 as amended in 1968. Introductory comments, however, will be addressed to this concept before directing the major focus of this paper to the general efficiency and ability of the R+D program in vocational education.

HISTORICAL PERSPECTIVE

Legislative intent dates back to 1917 when the Smith-Hughes Act enabled Federal monies to be utilized for "....making studies, investigations, and reports to aid in the organization and conduct of vocational education."[1] The George-Barden Act (1946) specifically provided that the States could use Federal funds for research. In 1962, however, the Willis Commission noted that while much has been done in the area of vocational education research, "....results have not been commensurate with the needs."[2] The Commission cited various challenges to vocational education in the future, among them: "If vocational education is to meet the needs of training in this rapidly changing world, it must adapt itself to changing conditions.... This is the task of research."[3] As a result of the Panel's findings and

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1. Public Law 347, 64th Congress, Section 1, February 23, 1917.

2. Education for a Changing World of Work, Report of the Panel of Consultants on Vocational Education, (Washington, D.C.: U.S. Government Printing Office, 1963), p. 195.

3. Ibid., p. 194.

* Prepared for the Committee on Vocational Education Research and Development, National Research Council, June 1, 1975.

recommendations, the Vocational Education Act of 1963 incorporated a strong emphasis on research. Section 4(c) of the 1963 Act authorized 10 percent of the monies appropriated under Section 2 "to pay part of the cost of research and training programs and of experimental, developmental, or pilot programs....designed to meet the special vocational needs of youth...."[4] Operational and administrative reorganization within the U.S. office of Education occurred, two national vocational education R+D centers were funded and, within two years of the Act's passage, the majority of States established Research Coordinating Units (RCU's). From all outward appearances, the vocational education community was gearing up to the legislative mandate. Again, however, presidentially-appointed reviewers concluded in 1968 that monies expended for research under the Vocational Education Act of 1963

> ....have produced only partial results in providing new information and directions immediately useful in implementing programs of vocational and technical education impacting on national issues and problems in occupational training.[5]

On October 16, 1968, then President Lyndon B. Johnson, by signing into law the Vocational Education Amendments of 1968, reinforced the continued national concern for making vocational and technical education available to more youth and adults across the country. That legislation set forth the following national policy relating to vocational and technical education:

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4. Public Law 210, 88th Congress, Section 4(c), December 18, 1963.

5. Vocational Education: The Bridge Between Man and His Work, General Report of the Advisory Council on Vocational Education, 1968, in Notes and Working Papers Concerning the Administration of Programs Authorized Under the Vocational Education Act of 1963, Public Law 88-210 As Amended, Prepared for the Subcommittee on Education, Committee on Labor and Public Welfare, United States Senate, (Washington, D.C.: U.S. Government Printing Office, 1968), p. 380.

> It is the purpose of this title to authorize Federal grants to States to assist them to maintain, extend and improve existing programs of vocational education, and to provide part-time employment to continue their vocational training on a full-time basis, so that persons of all ages in all communities of the State -- those in high school, those who have completed or discontinued their formal education and are preparing to enter the labor market but need to upgrade their skills or learn new ones, those with special educational handicaps, and those in post-secondary schools -- will have ready access to vocational training or retraining which is of high quality, which is realistic in the light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training.[6]

So began what many (including the writers of this paper) believed to be a new era in the provision of vocational education opportunities to the Nation's citizenry. All are familiar with the provisions of the 1968 Amendments, including those parts which have fostered vocational education R+D efforts, namely, Parts C, D and I. Among other specific purposes, these parts made Federal monies available for research and training; experimental, developmental and pilot programs; demonstration and dissemination projects; exemplary programs and curriculum development activities. Since 1965, the time of the first categorical funding for research and development in vocational education, nearly $250 million in Federal vocational education funds have been spent in attempting to address the challenges directed toward vocational education.

INHIBITIONS TO OPTIMUM SUCCESS

The case can undoubtedly be made that the research and development program in vocational education has come a long way and has contributed substantia.ly. In retrospect, however, it seems appropriate to look at factors that appeared to inhibit an optimum R & D research program for any

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6. Public Law 576, 90th Congress, Title I, Part A, October 16, 1968.

lessons that may apply to the future.

1. Lack of Adequate Numbers of Trained Vocational Education Researchers.

Prior to the Vocational Education Act of 1963, there was very little availability of funds for research in vocational education. Therefore, there were only a very limited number of vocational educators spending even part-time in the research activity and these were almost exclusively in the areas of agriculture and home economics. Of those qualified to do research, most were highly committed to a load in teacher education. Teacher education and research, with the expanding vocational education program in the 1960's, tended to compete for the time of the same professionals.

2. Lack of Confidence by Commissioner in Vocational Educators.

The U.S. Commissioner of Education chooses to staff the research portion [Part 4(c)] of the Vocational Education Act of 1963 with persons outside of vocational education and, for the most part, outside of public education. While there was some merit to "including in" persons from other disciplines, through a reorganization by the Commissioner, this "vocational education" staff-non-committed and non-experienced — became a part of a research unit separately administered in the Office of Education. Communications and mutual respect with vocational education leadership in the States dwindled to the point that, in spite of the fact that the Act called for ten percent of the funds appropriated be used for research, Congress did not fund the research portion of the Act at its authorized level.

3. Problems in Developing an Organization Structure for Research.

The Federal-State-local relationship in vocational education had been strongly established for program operation. However, there still remains the problem of how to make the best use of these relationships for the purpose of developing a nationwide program of research. How should projects

be funded? What is the role of the States in projects funded on a national basis, or to universities or local school districts?

4. Lack of Long-Range Priorities and Planning Mechanisms

Little has been accomplished in setting long-range goals for vocational education research and development. Monies have been awarded on the basis of unsolicited proposals, formal requests for proposals and in response to programs for which "priorities" have been announced. How such determinations are made and who makes them have significant impact on the direction of vocational education research and development, but, until this point, these decisions have been made with a limited semblance of long-range planning.

5. Organization within HEW.

The problems of continuous reorganization and assignment of responsibility in the office of Education has not provided continuity of direction and leadership and the role of the Office of Education and the National Institute of Research in research activities seems somewhat unclear with NIE apparently committing the same mistake initially as the office of Education in not relating research activities through their professional staffs to the leadership in education in the States.

6. Magnitude and Continuity of Funding

In spite of the fact that some dollar resources have been made available for research in vocational education, expenditures on a per capita basis of those being trained is extremely small. State legislature and State boards of education have not made substantial commitments of their funds. Research is primarily a Federally Supported Activity.

7. Lack of "Hard Money" Research Positions

Because of lack of continuity of Federal funding and lack of State commitment, there are few "hard money" positions across the nation in vo-

cational education research. For personal security, university staff are forced to seek tenure track teaching assignments seeking release from time to time on a part-time basis to do research if they can secure special research funds. Throughout the nation many staff members in Research in State offices are heavily funded with Federal funds and are dependent on annual funding from Washington for their jobs. For research centers, staffing is also difficult since positions are usually wholly dependent on securing individual grants.

8. Expectations of Research

Vocational educators have traditionally sought to get at least $1.50 value for every $1 committed. The philosophy makes it uncomfortable to take risks in research which may provide the potential for significant findings or long range pay off.

9. Money siphoned off to Support other Activities.

In the U.S. Office of Education, leadership in vocational education tended not to have control of how research funds were to be spent. The best current example is the substantial use of existing funds for career education. This is not to suggest that career education in its entirity should not be supported, but rather to suggest other resources should have been made available for those dimensions which do not deal rather directly with preparation for the work force. Many vocational educators would have enjoyed seeing Senator Mansfield attach an amendment similar to one he offered to the Defense Department's appropriations in the early 1970's to Parts C, D and I. The amendment declared, "....none of the funds authorized to be appropriated by the Act may be used to carry out any research project unless such project or study has a direct or apparent relationship to a

specific military function or operation."[7]

This paper is not the forum in which to again debate these expenditures but the authors of a supplementary report from Project Baseline raise an important question while examining this very significant issue:

> There is no doubt that the funds appropriated under Parts C, D, and I are properly accounted for in the legal fiscal sense in developing career education. But what has the impact been on Vocational Education from not spending that same money on research, exemplary program development, and curriculum development in Vocational Education? All of the Commissioner's Discretionary and a good deal of the State's portion has been spent for the National launching of career education programs.
>
> To ask about the use of Part C, D, and I funds for career education should not be interpreted to mean that the development of career education is not worthwhile or that Vocational Education may not be the segment of education that may ultimately benefit the most from career education. But Dr. Marland established a priority of intended impact when he decided to spend vocational monies for career education, rather than a more strict interpretation of Amendments. This interpretation has, in fact, redirected money that could have been used to fund program categories that, while specifically implied in the law, received little or no funds.[8]

THE FEDERAL ROLE

Vocational education programming across the Nation is, in part, indebted to efforts and activities undertaken in the name of R+D; and the vocational education research and development program is indebted to the Federal dollar. The ire of the vocational education community appears to have cooled since the issuance of the U.S. General Accounting Office's

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7. Congressional Record, November 20, 1970, pp. 518646-9.

8. Robert Miller and LaRue W. Miller, The Impact of Vocational Education Research at the Federal and State Levels, Project Baseline Supplementary Report, Northern Arizona University, Flagstaff, Arizona, October 25, 1974, pp. 57-58.

report[9] which initially raised the scorn of many persons. Whether one agrees or disagrees with the recommendations, one has to examine closely and critically a basic assumption made in the report -- namely:

> Federal assistance for vocational education is intended as a catalyst to encourage State and local governments to increase their funding, accord high priority to those individuals with special needs, provide programs geared to real and emerging job opportunities, and increase the number of participants in vocational education.[10]

The authors of the GAO report maintain their "review focused primarily on State programs supported under Part B,"[11] but we assert such a principle is more appropriate for vocational education R+D.

In substantiation and partial collaboration of this assertion we look to the comments of the State Director of Vocational Education from West Virginia. "These two areas (Part C, research and Part D, Exemplary programs) are prime sources of funds for the initiation of change in vocational education."[12] In addition, the Secretary of Health, Education and Welfare recently noted that the role of the Federal government should be to provide monies to spur change and innovation in vocational education. He also stated that only the Federal government is sufficiently large

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9. U.S. General Accounting Office, "What is the Role of Federal Assistance for Vocational Education?" Report of the Comptroller General of the United States, 1974, Report Number MWD-75-31.

10. Ibid., p. 8.

11. Ibid., p. 3.

12. Testimony presented to the U.S. Congress by Clarence E. Burdette, State Director of Vocational Education, West Virginia, in Reports on the Implementation of the Vocational Education Amendments of 1968, Prepared for the General Subcommittee on Education, Committee on Education and Labor, U.S. House of Representatives, (Washington, D.C.: U.S. Government Printing Office, November, 1973), p. 904.

to afford this kind of venture.[13] The Federal government, then, is seen to play the major role in support of vocational education R+D, in spite of the fact that the States do have the flexibility to support it with funds authorized under other parts of the Vocational Education Act.[14] That this is the case may be viewed in light of Henry David's insight that "the management of inquiry in the federal government today is best described as an art form which is unevenly developed and only partially understood."[15]

FORMULATION OF RESEARCH POLICY AND PRIORITIES

A review of past activity accomplished under the banner of vocational education research and development reveals a significant trend, one which should elicit at least some measure of discomfort in educational R+D circles. Policy decisions impacting the future of vocational education R+D have been occurring in an increasing manner at various levels and in various branches of government. This in and of itself is not disastrous as David's comment substantiates:

> Government is the agency through which these (society's public purposes, responsibilities and activities) are determined, expressed in the form of public policies, and assigned public resources for fulfillment.[16]

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13. Unpublished remarks made by Caspar Weinberger, Secretary of Health, Education and Welfare, before a Joint Meeting of the National and State Advisory Councils on Vocational Education, Washington, D.C., International Inn, May 2, 1975.

14. Howard F. Hjelm and Glenn C. Boerrigter, "The Vocational Education R+D Program", Presentation at the American Vocational Education Research Association Meeting, New Orleans, Louisiana, December 10, 1974, (mimeo), p. 5.

15. Henry David, "Comparative Analysis of Federal Models for Funding R+D", Presentation at the American Vocational Education Research Association Meeting, New Orleans, Louisiana, December 10, 1974, (mimeo), p. 8.

16. Ibid., p. 2.

The danger, however, exists in either an uninformed or insensitive "government" as it relates to educational research and development. We maintain that much vocational education R+D done in the past was initiated, to a great extent, from a position of defense, defense from detractors or from the ill-informed. This type of re-action, to prove the value of vocational education, only breeds further re-active efforts. A case in point relates to the call for accountability and is exemplified in cost-effectiveness or cost-benefit studies. The goals and purposes of research are many and varied, however, we maintain that studies such as cost-benefit often appear to be done "to prove vocational education's worth" and not to increase or better plan for its productivity in the future. Again, follow-up studies seem to lead to the statement, "We've done the job", rather than to serve as an evaluation tool for future program improvement. While we acquiesce to the accusation of overstatement, examples such as these point to a perceived trend we assert to be detrimental to purposes of vocational education R+D. We further submit that such a trend parallels Townes' conclusion:

> A general conclusion which seems to me to emerge from a historical approach -- the examination of a number of research case studies -- is that mankind consistently errs in the direction of lack of foresight and imagination. We continually underestimate the power of science and technology in the long term. Eminently knowledgeable planners and scientists, in attempting responsibly to make realistic appraisals of research, and facing what is at the time uncertain or unknown, all to frequently fall short in foresight and imagination.[17]

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17. Charles H. Townes, "Quantum Electronics, and Surprise in Development of Technology, "Science, Volume 159, 1968, p. 699.

This trend, while initially applicable primarily to vocational education R+D, seems to be increasing as evidenced by legislatively-mandated evaluations[18] and the admission that a prime source of research priorities emanates from the judicial branch of government.[19] As already noted, such a trend has a tremendous impact on the capability of vocational education research and development.

Policy related to this subject area has evolved over time in mysterious ways and continues, in large measure, to direct in a yet rather mysterious fashion the total R+D effort. Was the decision to establish Research Coordinating Units based on identified need, maximum consultation with States and projected benefits or did the powers in charge look for an expedient and politically safe way to expand appropriated Federal dollars? Were the decisions to fund and, subsequently, to discontinue support of national centers of vocational education R+D based on sound planning or on an expediency some might label "political"? More recently, how did priorities for Part C, U.S. Office of Education directed monies evolve? Rather than developing a capability whereby solid research and development activities could influence policy and decision-making, a welcome goal of any R+D effort, it appears paradoxical that in far too many instances externally determined policy limits and, in some cases, stifles the R+D endeavor.

> Decision-making, of course, is a euphenism for the attraction of resources -- money, position, authority, etc. Thus, to the extent that information is

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18. e.g. Public Law 380, 93rd Congress, Title I, Section 105 or title IV, Section 406(e), August 21, 1974.

19. Attributed to Roy Millenson, U.S. Senate Committee on Labor and Public Welfare, by Gilbert R. Austin, in "Federal Perspectives on Education", Educational Researcher, Volume 4, Number 5, May, 1975, p. 8.

> an instrument, basis, or excuse for changing power relationships within or among institutions, evaluation (and the writers of this paper would add research and development) is a political activity.[20]

Reasons underlying such an occurance are indeed complex. Leadership in the vocational education R+D community specifically and in the total of vocational education generally has been lacking regarding research policy decisions. At the risk of casting aspersions at a vast array of professional colleagues and personal friends, it must be noted that research subcommittees assigned by such organizations as the State Directors of Vocational Education, the National Advisory Council on Vocational Education and the American Vocational Association have continued the role of re-action to research and development already undertaken. Lest one interpret this statement to minimize the evaluation function of these groups, we wish only to emphasize the pro-active role groups such as these and others could and must play in the development of policy guiding future vocational education R+D efforts.

The history of the U.S. Office of Education as Federal manager of vocational education R+D has been less than glorious. From the days of reorganization to cope with the first categorical funding of vocational education research in 1964 through similar efforts in 1967 to today's dismal understaffing of the responsible Division within the Office of Education, the only certainty of the U.S. Office of Education's role is a myriad of uncertainties. Also, one cannot be particularly optimistic for any modification of the situation emanating from the National Institute of Education based on the record of its short term of existence.

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20. David K. Cohen, "Politics and Research: Evaluation of Social Action Programs in Education", Review of Education Research, Volume 40, Number 2, April, 1970, p. 214.

THE RESEARCH ENVIRONMENT

In turning attention to the research environment and its most important resource, personnel involved in the conduct of vocational education research and development, we can readily argue the point that personal contacts and friendships in the profession reveal a high degree of commitment and dedication. But as our colleague at the University of Wisconsin pointed out in 1968:

> Recent research reports on staffing in vocational and technical education have revolved primarily around the recruitment, preparation, and retraining of instructional personnel. Studies of supportive personnel in vocational and technical program operation have, at best, been peripheral to studies on or about teachers.[21]

It is our contention that little more is known about vocational education research personnel today. Who are the people who conduct research in vocational education? Where, why and how do they do it?

First of all, vocational education has been very generous in its invitations to researchers from other disciplines to assist in our endeavors. They in turn have provided us with much information, and valid criticisms and findings. Unfortunately, however, doors to vocational education research remain open only so long as resources await those who would enter.

> Three concerns are the improved coordination of State and Federal planning for R+D, the attraction of other scholars into the vocational education R+D community, and the greater utilization of the products of vocational education R+D.... One criticism of general education R+D, as well as vocational education R+D, is that it needs to attract

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21. Harland E. Samson, "Staffing", Review of Education Research, Volume 38, Number 4, October, 1968, p. 405.

> other scholars into its enterprise. Is this a valid criticism? One can surmize that there is value in someone from another discipline or field looking at a given problem. It is such type of behavior that often leads to creative solutions. However, one does not want to do this at the expense of not being able to serve the existing vocational education R+D community.[22]

To a large extent, however, persons in vocational education R+D roles emanate from within the profession or have been assimilated into the profession prior to accumulating R+D competencies. Formal training and upgrading has occurred in a somewhat haphazard manner. Funds available for the training of researchers have been viewed as available from Part F of the Education Professions Development Act, sums grossly inadequate to provide for the training needs of today's and tommorrow's vocational leaders. We submit further that programs in such institutions have been geared toward turning out teachers, teacher educators and administrators for whom the research dimension in such programs has been viewed only as a requirement for graduation. We must concede that, "the Ph.D. in Educational specialties does not always imply minimal competence in the design and conduct of R+D (as the PhD. was originally supposed to do)."[23]

Funds were made available in Part C of the 1968 Amendments, Research and Training in Vocational Education, under which training was described as coming from "....programs designed to familiarize persons involved in vocational education with research findings and successful pilot and demonstration projects in vocational education".[24] It was a wierd quirk of bureaucratic fate in which HEW legal counsel concluded, after passage

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22. Op. cit., Hjelm and Boerrigter, pp. 30-32

23. Robert M. Gagné, "Qualifications of Professionals in Educational R+D Educational Researcher, Volume 4, Number 2, February, 1975, p. 9.

24. Op. cit., Public Law 576, 90th Congress, Section 132 (2).

of the 1963 Vocational Education Act, that research monies could not support dissemination of research findings because section 4(c) of the Act did not specifically mention dissemination. The 1968 Amendments explicitly corrected this legal opinion but, we assert, clouded the goal of research training by confusing it with dissemination.

> The object of the training function is to recruit, train and retrain manpower necessary to undertake the various functions of research. The training function is often confused with the dissemination function, a function whose objective is totally different.[25]

The function and goals of dissemination are indeed of critical concern and there is general concurrence that increased emphasis should be given to its frition. While crucial to addressing the problem of the supply of trained researchers, dissemination of research and development findings in and of itself falls far short of ensuring an adequate force of competent personnel in vocational education research and development.

RESEARCH COORDINATION

Vocational education R+D transpires in many settings under varying circumstances. As their very name implies, Research Coordinating Units (RCU's) are charged with that coordination function at the State level. In some States, RCU's operate very well in all aspects of research and development including its conduct. Staffs with varying backgrounds and with varying degrees of expertise and experience have been assembled to provide a strong basis from which efforts tend to impact to a large degree program operation and administration.

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25. Gordon Swanson, "Strategies for Correlated Interface Relationships Between the Total State Program and Social Programs of Research", Proceedings: National Conference on Research, 1968 Vocational Education Amendments, Research Coordinating Unit, Oklahoma State University, Stillwater, Oklahoma, April, 1969, p. 76.

Other States rely heavily on contracting with organizations and agencies, most notably institutions of higher education, for the performance of needed vocational education R+D endeavors. Again, the quality and quantity of such activities are a function of the institutional commitment and the availability of qualified and interested professionals seeking to perform the research.

The Federal-State-local relationship on vocational education research and development, particularly as it relates to the coordination function, therefore, varies across States and, in many cases, changes in time, perhaps many times, in individual States. While not suggesting that this relationship should be of a singular nature in each and every State, efforts could be exerted at improving this function while at the same time fostering relationships needed at all levels of government responsibility in vocational education research and development.

THE CHALLENGE FOR RESEARCH AND RESEARCHERS

It seems quite clear that a number of conditions, if met, would contribute substantially to a more effective research and development program, including the insurance of adequate personnel to carry it out.

1. A greater commitment to research is needed at all levels of government, the Department of Health, Education and Welfare, the U.S. Office of Education, State Departments of Education and local school districts.
2. Research policies and priorities should be established by vocational educators in consort with other professional and lay groups. Such policies should be of a long-range nature addressing themselves to research needs, organizational strategies for completion, funding, coordination and personnel development.

3. The training of researchers should be given a higher priority. Several approaches are suggested: First, the continuation and expansion of the mini-courses for researcher training such as those which have been funded through the Ohio Center; and, secondly, the funding and development of a graduate program in one or more universities with a good research record for the training of researchers in vocational education. This might be funded as a part of the EPDA program or through other Federal funding.
4. The U.S. Office of Education in consort with the National Institute of Education needs to find ways to establish long-range policies and priorities with maximum input from the States and to secure funding commensurate with the magnitude of the job.
5. While there is no question that the competence of vocational educators to do research both in terms of quality of their backgrounds and their numbers has increased immeasurably since the passage of the Vocational Education Act of 1963, consideration should be given in funding strategies to insure that young aspiring researchers will have some opportunity to secure funding. Also, consideration should continue to be given to providing some funds on a State basis, at least on a short term basis, even though one might question whether this is most efficient.

CONCLUSION

The writers have attempted to be constructively critical of the research efforts in vocational and technical education and in some instances quite candid in expressing their understanding of what they believe are the facts.

It is our belief that such an approach will best serve the National Research Council in their deliberations.

It would be unfair, however, not to give recognition to the substantial improvements that have been made in research since the passage of the Vocational Education Act of 1963. The progession has come a long way as evidenced by: 1) the competition for funds through the number of proposals submitted for funding as compared to the number that can be funded; 2) the new organizational unit within the American Vocational Association for researchers and the attention to research at the annual convention; 3) the fact that each State now has a Research Coordinating Unit; 4) the dollar commitment for research which is not adequate but substantial; 5) the numbers of individuals engaged in some phase of vocational education research and development; and 6) the impact research and development activities have had on vocational education programs.

There are those who continue to be critical of present vocational and technical education programs, and with some justification, since it is through a continuous valuing that programs will grow and improve. However, vocational and technical education today is substantially different than prior to 1965 in many dimensions, including the categories of people served, occupations trained for, the expansion of members in numbers, the comprehensiveness of programs in each State in terms of levels served, the adequacy of facilities and other key dimensions. Research and development efforts have contributed significantly to these dramatic changes.

It is the thesis of this paper that vocational education and the persons it espouses to serve deserve the potential benefits of research and development. The current situation fails to maximize this potential. The challenge is how to best organize, plan, implement and disseminate research more effectively.